

Short Teaching Sequence
For students aged 15 to 17

What do we gain from circularity?

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TECHNICAL SHEET

Topic Circular Economy Opportunities.

Summary In this Teaching Sequence, students will choose a product to investigate. They will research the steps of production, distribution, consumption and disposal in the Linear Economy. Next, they will research and propose solutions to turn the linear process into a circular one, identifying the social, economic and environmental opportunities that Circular Economy enables.

Suggested audience Students aged 15 to 17 years.

Estimated length Four classes.

Curricular components Geography, History, Biology and Sociology.

Materials Computers with internet access, white paper (A4), brown paper (kraft), rulers, markers.

Learning objectives

Concepts: Linear Economy, Circular Economy, life cycle.

Procedures: Individual and group research; data collection and analysis; systematization of information; search for solutions; production of flowcharts.

Attitudes: Recognition of the value of teamwork. Respect for different points of view. Empathy. Weighting of facts. Development of notions of citizenship, ethics and sustainability.

Keywords Waste, resources, materials, energy, return and opportunity.

Related SDGs



SUMMARY OF STEPS

1. Exploring

In this Teaching Sequence students will work in groups to meet the following challenge: **How can Circular Economy turn challenges into opportunities?** For this, they will choose a product to investigate, inspired by the infographic on **“Opportunities in a circular world: more value for more people.”**

2. Investigating

As a homework assignment, the groups will research each stage of the life cycle of the product they chose to analyze. They should collect information about the processes, materials, energy sources and people (stakeholders) involved in the production, distribution, consumption and disposal steps of their product. Based on these data, the groups will analyze the main social, economic and environmental challenges of the product's linear life cycle.

3. Finding a solution

With research information in hand, it is time to think of ways to turn the selected product's linear life cycle into a circular life cycle. The groups should prepare flowcharts describing the proposed solutions for each step of the process. They should focus on ways to reuse the waste from the process, generate less waste and minimize the consumption of natural resources.

4. Sharing

Each group will present the solutions they found to the rest of the class, explaining how these solutions can meet the identified challenges. Finally, start a conversation about the social, economic and environmental opportunities that the Circular Economy enables for the present and the future.

STEP BY STEP

Introduction

Societies are organized to produce, consume and dispose of waste in a linear logic. However, many natural resources are being depleted and becoming increasingly scarce. At the end of the process, there is a huge volume of garbage going to dumps and landfills, or even building up in the environment, contaminating land, rivers and seas. Not to mention the gases that pollute the atmosphere and contribute to global climate change. That is why there is an increasing urge to find sustainable solutions.

However, if we pay attention to our own garbage, we will notice that we throw away a huge amount of valuable materials. What that in mind, Circular Economy proposes a new logic, in which all materials have to circulate within the system itself, without ever (or almost never) becoming garbage. Therefore, the challenges of the linear system can become opportunities in a circular system.

Understanding this change in perspective and finding solutions within the logic of Circular Economy is the objective of this Teaching Sequence.

Recommendation:

Introductory class on Circular Economy

Before going about this Teaching Sequence, we recommend conducting the [introductory activity on Circular Economy](#). This step is important to present the main concepts related to the topic.

1. Exploring

CLASS 1

Reading the infographic and choosing a topic for research | 15 minutes

To start, divide the class into groups of 4 to 5 people. Tell the students to access the [Circular Movement](#) platform and the infographic on **“Opportunities in a circular world: more value for more people”** (or else hand out hard copies). The students should read the infographic together.

Then, they will choose one of the examples in the infographic for further study. That will be the topic of the group to be investigated in the following steps.

New opportunities | 10 minutes

Talk to the students about one of the examples in the infographic to inspire them on how each group's approach to their topics might be. We suggest the example of “urban mining,” but others can be explored.

Ask questions to guide their work and encourage reflection on the opportunities that the Circular Economy enables. Here are some ideas for questions that can guide this conversation.

In a Circular Economy, how can we obtain value from waste?

Could new products be made from this material?

During the conversation, present ideas and concepts related to the notion of Circular Economy, remembering that opportunities can arise throughout the production chain: in the sorting and reuse of waste; in the design of new products and packages; in the logistics of transportation, storage and marketing of products; and even in how products and services are offered.

The challenge | 5 minutes

Based on these reflections on the opportunities of Circular Economy, launch the challenge that will guide the next steps:

How can Circular Economy turn challenges into opportunities?

Tell the students that this is the question they should try to answer during the next steps. The focus, both for challenges and opportunities, are social, economic and environmental aspects.

That is, they should turn the social, economic and environmental challenges of the Linear Economy into social, economic and environmental opportunities in the Circular Economy.

Choosing a product to investigate | 15 minutes

Groups should choose a product that is related to their selected topic. Give them time to talk and think about possibilities. They can list any ideas that come up and then decide. If they are in doubt about which one to choose, ask them to draw or vote.

Recommendation:

They can come up with ideas of services too, not only products. In such cases, advise them to think of a product related to that service to facilitate the investigation.

Guidelines for home research | 5 minutes

As a homework assignment, students will do some group research. Emphasize that the information collected in the research steps will be fundamental for meeting the challenge in the next classes. Instructions on how to do the research are given below.

2. Investigating

AT HOME

Research on the linear system

Remind students that the goal is to turn the social, economic and environmental challenges of the Linear Economy into social, economic and environmental opportunities in the Circular Economy.

To begin, they should research the investigated products within the logic of the Linear Economy. Emphasize that they have to investigate the different stages of the life cycle of the product chosen by the group:

Production, distribution, consumption and disposal.

The students should consider material, energetic and human processes and resources involved in every stage.

In all stages, the following items should be investigated:

1. What activities and processes are involved?
2. What types of material are used?
3. What energy sources are used?
4. Who are the stakeholders throughout the process?

As they collect information, they should identify challenges in the linear process. But they can also list what they consider to be the advantages of this model.

Systematization of information

The students should systematize the information according to the chart below, which can be handed out in hard copies to each group, copied from the blackboard or even shared as a document online.

RESEARCH ON LINEAR ECONOMY				
RESEARCHED PRODUCT:				
STEP	PROCESSES	MATERIALS	ENERGY	PEOPLE
1. PRODUCTION				
2. DISTRIBUTION				
3. CONSUMPTION				
4. DISPOSAL				

Recommendation: It is important that the research be done on trusted websites to ensure reliable information. Instruct them to note down all the sources they use and relate them to each piece of information.

CLASS 2

Identification of challenges | 30 minutes

In the classroom, with the charts filled out by the groups, students should analyze each stage, identify and list the social, economic and environmental challenges related to the product's linear life cycle. Most of the challenges should be related mainly to the extraction of natural resources, the emission of pollutants and the generation of waste. But social issues related to the process should also be identified.

Presentation of results | 15 minutes

After identifying the challenges, each group will present their research and conclusions to the rest of the class. Encourage discussion among the students, but make sure to organize and control the time of this stage. Before the end of the class, advise the students about the new research that they should carry out at home.

Guidelines for home research | 5 minutes

To solve the challenge proposed by this Teaching Sequence, students will be inspired by real cases and look for examples from around the world that are related to the product they are studying, considering a more circular approach. The guidelines for this research can be found below.

How can Circular Economy turn challenges into opportunities?

AT HOME

For the next class, groups should research Circular Economy solutions for the same steps, following the table structure. However, in Circular Economy, different points related to the product life cycle should be reconsidered and rethought.

RESEARCH ON CIRCULAR ECONOMY				
RESEARCHED PRODUCT:				
STEP	PROCESSES	MATERIALS	ENERGY	PEOPLE
PRODUCTION				

DISTRIBUTION				
CONSUMPTION				
RETURN				

Tell the students that they should start from the challenges of the Circular Economy and investigate existing solutions and technologies that can contribute to turning challenges into solutions and opportunities in the Circular Economy.

To guide the investigation, they can seek answers to questions like:

1. What types of raw materials can be used to make this product in a Circular Economy setting?
2. Is it possible to use renewable energy for production and distribution?
3. What job opportunities can arise with the new modes of production?
4. How can discarded waste become resources and raw materials for other processes?

As they collect information, they should identify opportunities to turn the linear process into a circular one. But they can also identify and note down the challenges to implementing these ideas.

Recommendation: It is very important that these research activities bring solutions that go beyond simple ideas of recycling or reuse. Students are expected to present solutions related to the production, consumption and disposal processes, without forgetting the opportunities created for different stakeholders within the Circular Economy.

Evaluation

For the evaluation of individual research, the following criteria may be used:

- Did the groups find and note down any possibility of using waste as a resource?
- Did the groups find and note down any possibilities for the destination of product waste?
- Did the groups find and note down any possibility related to the generation of renewable energy?
- Did the groups find and note down new job opportunities in the researched processes?
- Did the groups go beyond the mandatory items of the research questionnaire?
- Can the presented information be checked and confirmed?

3. Finding a solution

Now it's time to put everything into practice and come up with answers to the proposed challenge. For this, in the classroom, the students should form groups again and bring their notes of previous classes, as well as the results of the research done as homework.

CLASS 3

From linear to circular | 15 minutes

Again, students should gather in groups.

Write the challenge on the board:

How can Circular Economy turn challenges into opportunities?

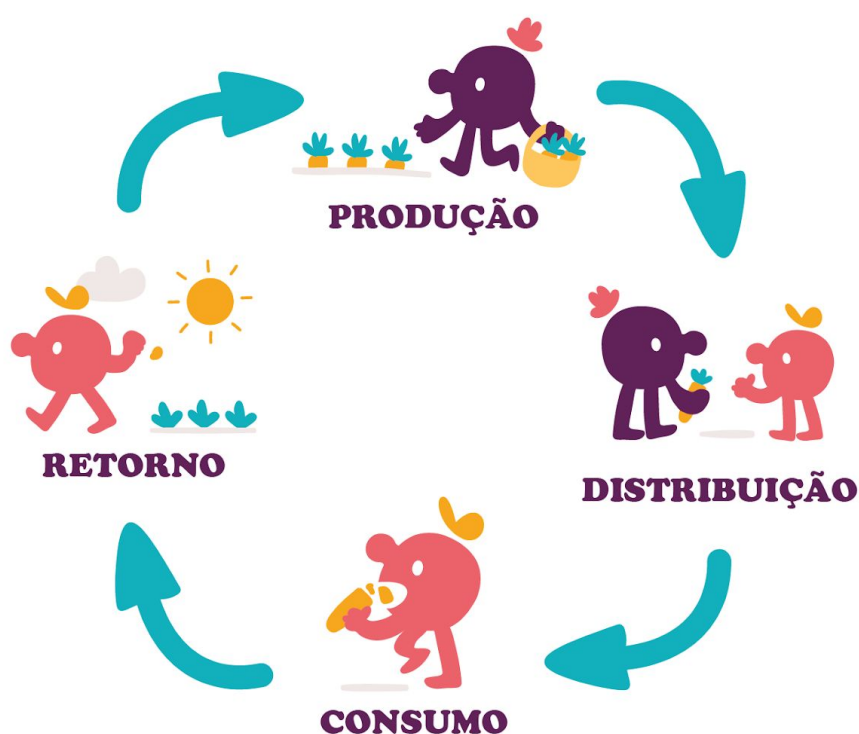
Instruct students to review the charts filled out in previous classes. The goal now is to think about how to make the linear process more circular.

For this, students should take into account the alternatives found in previous research.

Circular flow design | 35 minutes

To meet the challenge, the groups should first review their notes and talk about the possibilities they envision, how to turn linear into circular and challenges into solutions.

Then have students prepare a flowchart of the circular process related to the product they are studying. The main objectives are to eliminate the extraction of natural resources (at least, non-renewable resources), to stop waste from becoming garbage and to find new opportunities for the stakeholders.



Inform them that in the next class they should present their flowcharts to the rest of the class. To do this, they should prepare to answer two questions:

1. Was the group's solution able to eliminate the concept of garbage? How so?

2. Did the solution decrease or eliminate the need for non-renewable natural resources? How so?
3. What new stakeholders emerge or gain importance in a Circular Economy?

Evaluation

To evaluate the Circular Economy flowchart, consider whether the solutions meet the corresponding challenges.

Compare the suggested changes from the linear to the circular process and see whether there is any progress that makes the process more circular.

4. Sharing

CLASS 4

In this class, students will have the opportunity to enrich their analysis with the knowledge derived from the comparison with projects from other groups. For this class, arranging the students in a large circle can be interesting.

Group presentation | 30 minutes

All groups should present their flowcharts with their suggested changes to the process. In this presentation they should answer the following questions:

1. Was the group's solution able to eliminate the concept of garbage? How so?

2. Did the solution decrease or eliminate the need for non-renewable natural resources? How so?
3. What new stakeholders emerge or gain importance in a Circular Economy?

Reflecting on the opportunities of a circular world | 20 minutes

After the presentation of the groups, encourage conversation about the opportunities of the Circular Economy. Remember that these can be social, economic or environmental opportunities.

What new economic and social opportunities emerge from a more circular logic?

In a more circular logic, stakeholders who work with selective waste collection, recycling, repair of damaged equipment, among others, play a fundamental role. Emphasize the importance of people in the transition to a Circular Economy.

Recommendation: The Teacher and the class can address this topic in greater depth in the long Teaching Sequence for High School proposed in this publication.

Important tip:

It may be interesting to choose a central place in the school to exhibit the flowcharts produced by the class.

In this case, there should also be a poster introducing the project, telling what the challenge was, how the research was done and how they attained the final result. Then display the project presentation poster along with the groups' flowcharts.

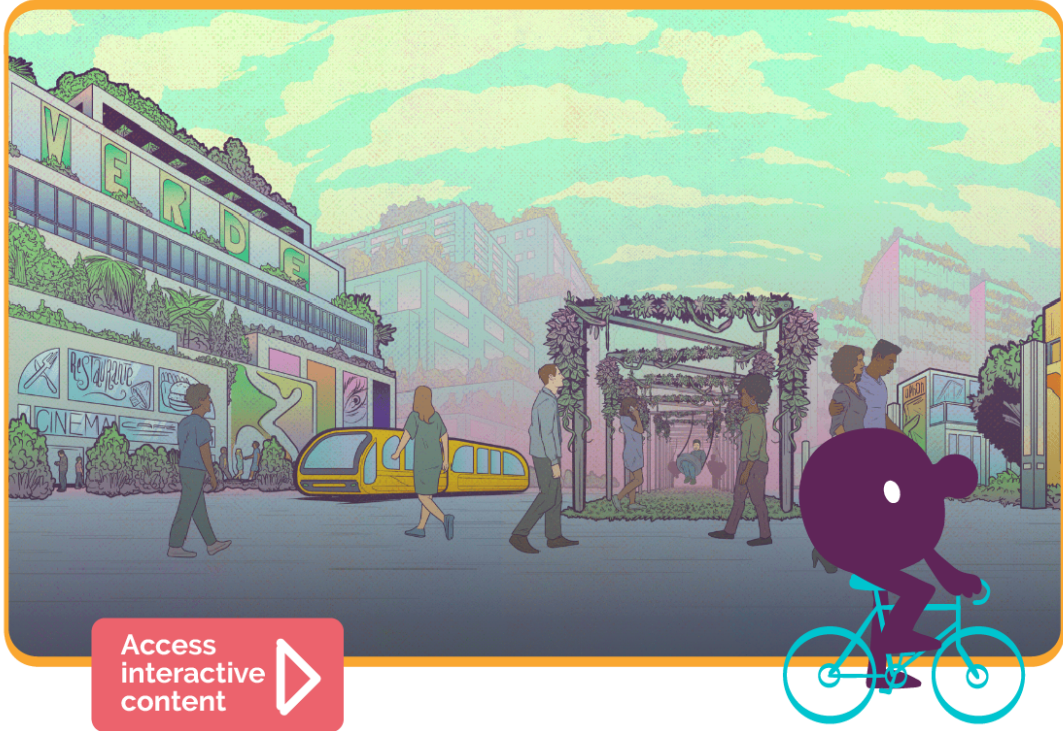
To encourage reflection from the viewers, ask questions like: **And how can you make your life more circular?** There may be a space for people to leave their answers to the question.

Evaluation

All the steps of this Teaching Sequence are subject to evaluation, as highlighted below:

- Analysis of participation and answers given to questions in the exploration stage and data collected in the investigation stage;
- Preparation of the flowchart in the solution finding stage;
- Development of critical and argumentative skills based on concepts, data and information.

In this way, you can assess your students' understanding of the social, economic and environmental advantages enabled by the Circular Economy within a context.



REFERENCES

Videos:

Circular Economy: rethinking progress

<https://www.youtube.com/watch?v=OWxy4PXq2pY>

Meet the people rethinking ownership

<https://www.youtube.com/watch?v=oOKpymOgqWw>

NGO Global Footprint Network calculates humanity's Ecological Footprint.

<https://www.youtube.com/watch?v=SD4zArzv96s>

Meet the people rethinking ownership

<https://www.youtube.com/watch?v=oOKpymOgqWw>

Websites:

Circular Economy - UK, USA, Europe, Asia & South America - The Ellen MacArthur Foundation

<https://www.ellenmacarthurfoundation.org/>

The Circular Design Guide

<https://www.circulardesignguide.com/>

New Plastics Economy - The Future of Plastics - New Plastics Economy

<https://www.newplasticseconomy.org/>

Circulate News - Medium

<https://medium.com/circulatenews>

Circular Idea - Circular Design and Economy in Brazil

<https://www.ideiacircular.com/>

Texts and documents:

What is Cradle to Cradle?

<https://www.ideiacircular.com/o-que-e-cradle-to-cradle>

What is Circular Economy?

<https://www.ideiacircular.com/economia-circular/>